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**Sent:** Tuesday, September 13, 2005 11:57 PM  
**To:** ccrsgcomments@resources.ca.gov  
**Cc:** Marc Shargel; Jesus Ruiz; Mark St. Angelo; Stephen M Barrager; Rick Starr; Mark Carr  
**Subject:** Evaluation Criteria Matrix for Existing MPAs

The MLPA and DFG staff have made a good first pass at establishing an evaluation matrix for existing MPAs. The current spreadsheet is a mix of qualitative and quantitative information, with creative effort to quantify several regional objectives. If wisely and carefully constructed, with fair rating to each objective, it may even be possible to develop overall scores with which to compare different MPAs. It should be noted, however, that the way these different objective criteria are quantified involve value judgements. Moreover, different stakeholders would weigh different design considerations and objectives more or less heavily. If there is an effort to develop an overall "score" for MPAs, the spreadsheet should have the option of inputting weighting coefficients for various objectives, especially if there is a cumulative score at the end comparing different MPAs.

Specific comments follow:

#### REPRESENTATIVE HABITATS:

Kelp forest should be split into two distinct habitats: *Macrocystis* (giant kelp) and *Nereocystis* (bull kelp), just as there already is a distinction made between eelgrass and surfgrass seagrass beds.

Estuary should be added as a habitat.

#### SIZE and SPACING

Distance between marine reserves should not be "straightline distance", but instead should be "alongshore span" or coastline length, per the specific wording of the Master Plan Framework (see MPF page 37, under "Overall MPA and network guidelines").

Distance should be to the next MPA of equal or greater protection. Therefore, the distance between Marine Reserves should be to the next Marine Reserve, even if there is a closer intervening Marine Park or Marine Conservation Area.

See Goal 5, Objective 2 for further comments regarding appropriate size and spacing evaluation criteria to meet the scientific guidelines in the Master Plan Framework.

#### CCRSg DESIGN CONSIDERATIONS

DC 7. For the "eyes on the water" objective, use the following indicator: fraction of MPA coastline with adjacent park, research facility, etc (i.e. miles of park frontage/ total MPA coastline) PLUS an indicator of proximity to the nearest harbor with a DFG enforcement boat, as follows: (25 miles minus distance from DFG boat harbor to center of MPA)/25 miles. The DFG boat enforcement indicator approaches 1.00 for an MPA close to the DFG boat mooring, and becomes negative at distances greater than 25 miles.

DC 8. The objective measure here could be the fraction of volunteer research surveys in the region that were conducted in the MPA of interest. For example, the measure could be the fraction of the 1398 total REEF surveys conducted between 1997 and 2004 in the MPA, plus the fraction of total PISCO surveys

conducted in the MPA. The REEF survey information has already been transmitted to John Ugoretz in spreadsheet form. For the existing MPAs, the REEF survey measure would be as follows:

Hopkins Reserve:  $14/1398 = .010$

Pacific Grove Marine Conservation Area:  $273/1398 = 0.195$

Carmel Bay Marine Conservation Area:  $264/1398 = 0.189$

Pt. Lobos Marine Reserve:  $129/1398 = .092$

#### GOAL 1, Obj 1

If MPAs are compared using cumulative scores, then this objective should be quantified, and should include several measures, including finfish diversity and abundance, invertebrate diversity and abundance, marine mammal diversity and abundance, seabird diversity and abundance, etc. The REEF database could be used to provide an indicator of fish species diversity, for the areas in south Monterey Bay and Carmel Bay, where most surveys have been conducted.

#### Goal 1, Obj 2

John Ugoretz provided good insight at the last CCRSG meeting about how the indicator in its current formulation comes up with anomalous results, strongly and unfairly favoring very small reserves. For instance, a small reserve with a constant sloping hard bottom, extending only to 30 meter depth would have a higher score ( $1/30$ ) than if the same coastline reserve extended out to 100 meter depth even though it encompassed two depth habitats ( $2/100 = 1/50$ ). The current formulation actually penalizes reserves that stretch to include additional habitat. A better indicator would be number of habitats per mile of MPA coastline, and the best indicator is the number of habitats divided by the square root of the miles of MPA coastline.

The recommended indicator above (habitats / sq.rt. miles of coast) should be augmented by a second indicator that captures habitat "rugosity" and length of interface between habitats. I believe this second indicator actually captures the true intent of the wording "diverse habitat types in close proximity to each other," reflecting the ecological phenomenon that species diversity and abundance is greatest at the interface between habitats. This is essentially a "surface to volume" ratio, or "interface length to area" ratio. A straight line interface between sand and rock should have a much lower value than a rock/sand interface that undulates and weaves in plan, folding back on itself and creating many miles of interface per square mile of area, just as an undulating deeply crenulated coastline has greater ecological value than a straight coastline. As a first pass, Dr. Rikk Kvitek should be consulted to see if he can suggest a quantifiable measure of benthic "rugosity".

#### Goal 1, Obj 3

Quantify the number of species protected. Perhaps number of key species protected divided by total number of key species.

#### Goal 1, Obj 4 & 5

Use a simple protection measure: Marine Reserve = 3, Marine Park = 2, Marine Conservation Area = 1.

Or make more sophisticated by weighting according to size, spacing and habitat inclusion, as discussed in Goal 3, Obj 2 and Goal 5, Obj 2 below.

## Goal 2, Obj 1

The presence of rare "key" species is only a portion of this objective. There also needs to be a depletion indicator, where historic fishing records indicate that previously overfished species (such as bocaccio and canary rockfish) were once abundant, but are now scarce, offering the opportunity to rebuild depleted species.

## Goal 2, Obj 2

Provide highest points for Marine Reserves, followed by Marine Parks with special restrictions (e.g. bag and slot limits), Marine Parks without special restrictions, etc.

## Goal 2, Obj 3 - no comment

## Goal 3, Obj 1

This objective can be quantified as follows: For all institutions and cities within 25 miles of the MPA, count each city or institution as follows:  $(5 - (\text{distance to institution or city})^{0.5})/5$ . For instance, Hopkins Marine Reserve, with Hopkins Marine Station immediately adjacent and the Aquarium 1/4 mile away would have an institution score of  $(5-0)/5 + (5-.5)/5 = 1.9$ . Add to this all other cities and institutions within 25 miles, and also add to this an indicator of "areas of traditional nonconsumptive recreational use."

Add to this the city indicator, in the same fashion, with cities such as Pacific Grove and Carmel weighted in relation to Monterey, e.g.  $\text{Pop. of Carmel} / \text{Pop. of Monterey}$ , times the distance indicator described above.

The "areas of traditional nonconsumptive use" could be miles of coastline times an indicator of relative popularity, such as a LaFranchi intensity/popularity indicator (on a scale from 0.00 to 1.00). Another popularity indicator could be the fraction of REEF survey dives in the MPA, as previously described under Design Consideration 8.

## Goal 3, Obj 2

This is a measure of scientific replication for the entire region. Since Marine Reserves are the limiting quantity here for statistical replication, consider the following measure for the Central Coast Region:

$(\text{total number of marine reserves})^2 \text{ plus } (\text{total number of marine parks}/2)^2 \text{ plus } (\text{total number of marine conservation areas}/4)^2$

The number of marine reserves is taken to the second power to indicate the exponentially increasing statistical power offered by replicating marine reserves.

An even more sophisticated measure would also take into consideration the size of the MPAs, so each of the above three quantities would be weighted as follows for its respective MPA type:

$((\text{average coastal length in miles for MPA type})/6 \text{ miles}) \text{ times } ((\text{average distance out from shore in miles for MPA type})/3 \text{ miles})$

This proposed weighting factor "rewards" a region with MPAs with an average coastal length approaching or exceeding the SAT recommendation of 3-12 miles, extending out to the 3 mile limit of state jurisdiction, also per the MPF SAT recommendations.

Finally, to capture habitat diversity, and the additional opportunities that offers for research, consider weighting each of the three variables above with the previously discussed habitat diversity index, averaged for that MPA type. The habitat index should be number of habitats divided by the square root of coastal length.

Note that this is an overall score for the region, based on the total array of MPAs in the MPA design being considered for the region. See goal 3, Obj 4, for a similar measure applied to an individual MPA.

Goal 3, Obj 3: no comment

Goal 3, Obj 4:

A good measure here of protection and enhanced recreational experience would be similar to that described for Goal 2, and would reflect the extent of protection and size of reserve (and hence buffering distance to adjacent heavy fishing):

$$((\text{average coastal length in miles for MPA type})/6 \text{ miles}) \times ((\text{average distance out from shore in miles for MPA type})/3 \text{ miles}) \times (45 \text{ miles}/\text{avg distance to next marine reserve to north and south}) \times (1 \text{ for Marine Reserve, } 0.5 \text{ for Marine Park, } 0.25 \text{ for Marine Conservation Area})$$

Goal 4, Objective 1:

Consider adding fish nursery areas (i.e. larval settlement and grow-out areas) to the list of special habitats.

Goal 4, Objective 2:

This is a regional measure, not an individual MPA measure. A good measure that captures both protection and replication would be:

For each habitat, sum of habitat occurrence times MPA protection weighting factor (MR = 1, MP=0.50, MCA = 0.25). For instance, if you had 4 marine reserves (MRs) with habitat A and 2 MRs with habitat B, and 2 MPs with habitat A, and 2 MCAs with habitat B, the region score would be:  $4 + 2 \times 0.5$  (habitat A) plus  $2 + 2 \times 0.25$  (habitat B) = 7.5 for the region.

Goal 5, Obj 1: no comment

Goal 5, Obj 2: use the scientific guidelines in the Master Plan Framework

The MPF explicitly recommends MPAs 3-12 miles long, spaced no more than 30-60 miles along the coast. Therefore, a good measure for individual MPAs would be:

$$((\text{average coastal length in miles for MPA type})/6 \text{ miles}) \times ((\text{average distance out from shore in miles for MPA type})/3 \text{ miles}) \times \text{protection factor (MR = 1, MP = 0.5, MCA = 0.25)} \times \text{number of habitats} / \text{sq.rt. of coastal length}$$

While for the entire region, the measure should be the same as described under Goal 3, Obj 2, with the replication indicator (number of MPAs of a certain type taken to the second power) multiplied by the average size/spacing/protection indicator for that MPA type described immediately above.

Goal 6, Obj 1 & 2

Adjacent regions could add their "protection/replication" scores described in Goal 5, Objective 2 above, to assess the overall statewide network, with highest scores indicating greatest conservation value.

I hope the above suggestions are useful, and promote further creative thinking about ways to quantify the regional objectives in evaluating MPAs.

The other two nonconsumptive diver representatives on the CCRSG, Jesus Ruiz and Marc Shargel, are currently on vacation and are unable to comment on the evaluation matrix. They have both asked me to review and respond to the evaluation criteria, with special consideration regarding Goal 3, Objectives 1 and 4. I trust I have captured at least some of their concerns that those objectives in particular be fairly weighed and evaluated.

Respectfully submitted,

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